Space Weather Technical Forecast

Issued on Wednesday, 07 August 2024 at 01:09 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further M-class flares expected with a chance of isolated X-class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate over the period, with an M1.1 at 06/0303 from AR3781.

There are currently eight numbered spot groups on the visible disc. AR3780 remains the largest and most complex region on the disc, with a large negative leader spot, but also a proliferation of small spots amongst a broad area of plage to its south and southwest. One of these was the source of the impulsive X-class flare on 05 Aug and this area has a mixture of ongoing development along with increasing visibility as the region moves to a less oblique angle. AR3774 and AR3777 in the centre disc, are also both showing further growth, and increased complexity, particularly AR3777 with fairly rapid emergence of new intermediate and trailing spots. However these regions have remained largely stable. The other regions on the disc are all smaller and simpler, although AR3781 in the northeast is perhaps more active than its simple bipolar appearance suggests, as a source of the most recent M-flare. A new region is also emerging on the far east disc from around the far-side, however this currently remains too close to the limb to assess.

No Earth-directed Coronal Mass Ejections (CMEs) have been identified in imagery.

Solar Wind / Geomagnetic Activity: Solar wind speeds fluctuated predominantly between 390-450kms/. Density remained at or below average. Interplanetary Magnetic Field, Bt, was Weak, below 6nT, while the north-south component was weak and variable, between -4nT and +5nT. Phi angle was negative (towards the Sun). Geomagnetic activity remained Quiet (Kp 1-2).

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux observed by GOES18 remained below the S1 Minor Radiation Storm threshold, but was initially elevated above background following the X1.7 flare from the west limb on 05 Aug, peak at 2.8 pfu at 06/0105 UTC. Levels gradually declined through the period to return close to background again. High energy electron flux (greater than 2MeV) observed at GOES16 was also at background. The 24-hour fluence was below the Active threshold with 1.32e6 integrated pfu observed at 07/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to High solar activity is forecast to continue, with occasional M-class flares expected and a chance of isolated X-class flares.

Solar Wind /Geomagnetic Activity: There are no Earth-directed CMEs, with no significant coronal hole fast wind arrivals expected in the period. However, weak passing transients remain possible due to the number of off the Earth-Sun line eruptions that have occurred. Geomagnetic

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activity is forecast to be mainly Quiet with isolated Unsettled intervals.
Energetic Particles / Solar Radiation: High energy proton flux is expected to persist around background levels. Should any further notable flares occur, especially in the western disc, there is the potential for flux to rise further with a slight chance of exceeding the S1/Minor Radiation Storm threshold. The high energy electron flux is forecast to be at mostly background levels. The associated 24-hour fluence is expected to remain below the Active threshold (1e8 integrated pfu).

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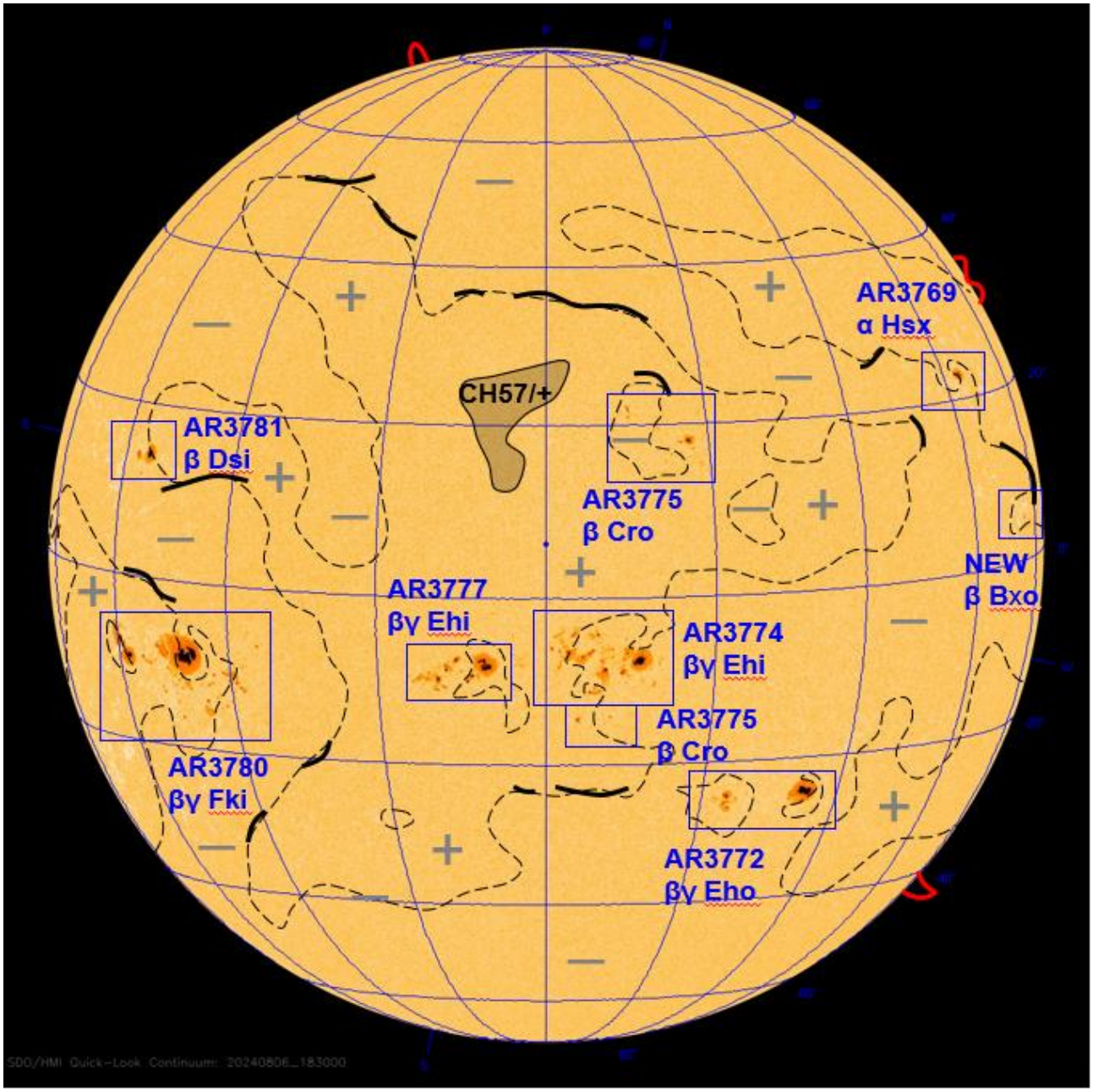
Figure 1. Solar Analysis Valid 06/1900UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are currently no Earth-directed CMEs expected, however given the number of CMEs that have occurred off the Earth-Sun line in recent days, some slight transient glancing effects cannot be completely ruled out, especially later in the period.

Solar winds are currently slightly elevated, having eased after recent CME and possible weak coronal hole effects. No further enhancements are currently indicated, with CH57/+ not expected to give any significant activity later in the period. Solar winds are expected to persist close to background levels. Geomagnetic activity is forecast to be mostly Quiet with isolated Unsettled intervals. There is a slight chance of Active intervals if any transient effects should occur.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	5	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

None expected.

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Radio Blackouts - X-Ray Flares:

Moderate to High activity is expected with further M-class flares expected and a chance of isolated X-class flares.

There are nine sunspot regions on the visible disc, eight numbered. AR3780 remains the largest and most complex region on the disc, with a large negative leader spot, but also a proliferation of small spots amongst a broad area of plage to its south and southwest. One of these was the source of the impulsive X-class flare on 05 Aug and this area has a mixture of ongoing development along with increasing visibility as the region moves to a less oblique angle. AR3774 and AR3777 in the centre disc, are also both showing further growth, and increased complexity, particularly AR3777 with fairly rapid emergence of new intermediate and trailing spots. However these regions have remained largely stable. The other regions on the disc are all smaller and simpler, although AR3781 in the northeast is perhaps more active than its simple bipolar appearance suggests, as a source of the most recent M-flare. A new region is also emerging on the far east disc from around the far-side, however this currently remains too close to the limb to assess.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	80	80	80	80
Very Active	R3 to R5 X Class	No	20	20	20	20

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Solar Radiation Storms - (High Energy Protons):

High energy proton flux, as observed by GOES-18, was elevated but below the S1 Minor Radiation Storm level at the start of the period, in response to the X1.7 flare from ex-AR3767 on the west limb on 05 Aug. However, the proton flux gradually eased through the period and is now close to background. Any further strong flares will bring the potential for a slight chance of reaching/exceeding the S1 Minor Radiation storm level. While the potential for any influence from the beyond the west limb (ex-AR3767) will recede day 1 (07 Aug), this will be tempered by an increasing risk from AR3774 and ultimately AR3780 as these regions move further west and into increasingly Earth-connected locations.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	15	20	20	20
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux, as observed by GOES-16, is currently at background. In the absence of any notable fast wind arrivals, the observed flux is expected to remain at or near background levels, perhaps rising to Moderate at diurnal peak as the Van Allen Belts relax outward after the CME arrival on 04 Aug.

The associated 24hr electron fluence is expected to remain below Active (1e8 integrated pfu), but perhaps with a slight rising trend, as indicated in MOSWOC REFM.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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